PHYSICAL SCIENCES

VISTAS

PERSPECTIVES ON EXCELLENCE IN MISSION OPERATIONS | ISSUE 2 2020

Our critical national security missions—ensuring a safe, secure, and reliable nuclear deterrent; reducing global nuclear threats; and providing the U.S. Navy with safe, militarily-effective naval nuclear propulsion—mean we cannot stand down operations and wait until the national emergency is over. Despite the challenges ... , we continue to deliver on our critical national security missions while aiming to keep our workforce safe and healthy.

INSIDE

- Dedication and collaboration accelerate mission-essential LANSCE isotope production
- Rigorous operations result in newly outfitted gloveboxes
- Continuous improvements deliver high-value subcrit data
- 'Magnet surge' expands capabilities for higher tesla science

Los Alamos
NATIONAL LABORATORY
EST. 1943

ESSENTIAL OPERATIONS ISSUE

Rolling with science: A member of the Deformation Processing Team in Fabrication Manufacturing Science (Sigma-1) prepares to hot roll a metal blank to measure the influence of processing on performance. Sigma Division's specialty, manufacturing science, lets researchers understand and guide processing decisions across all key mission pillars at the Laboratory, from accelerator technologies to nuclear weapons.

CONTENTS

1 From Toni's desk

2 Dedication and collaboration accelerate mission-essential LANSCE isotope production

4 Rigorous operations result in newly outfitted gloveboxes ready for 'hot testing'

6 Cygnus: Continuous improvements and meticulous operations deliver high-value subcrit data

8 Safe, efficient, organized approach to legacy materials enables Sigma mission-critical work

9 Delivering responsiveness for LANSCE research and accelerator operations

10 Meet Anthony George

11 'Magnet surge' expands capabilities for higher tesla science

12 In your words …

On the cover: Quote from Lisa Gordon-Hagerty, April 23 communication. Gordon-Hagerty is Under Secretary for Nuclear Security of the US DOE and Administrator of the NNSA.

LEARN MORE ABOUT PHYSICAL SCIENCES
AT LOS ALAMOS NATIONAL LABORATORY
WWW.LANL.GOV/ALDPS

FROM TONI'S DESK

Toni Taylor, Associate Laboratory Director for Physical Sciences

I am proud to introduce the 2020 summer issue of *Physical Sciences Vistas* with a focus on "excellence in mission operations." Los Alamos National Laboratory overall, and our Physical Sciences Directorate (ALDPS) specifically, is known for excellence in our NNSA and DOE missions as well as our science and technology. Excellence in mission operations requires the execution of sustained operations that are reliable and responsive to mission needs across all work being performed in ALDPS, and thus underpins our ability to excel in our S&T and our missions. For all of us, adherence to the Safe Conduct of Research (SCoR) Principles (below left) is essential to achieving a safe and productive environment that enables overall excellence.

ALDPS is a large and complex organization, with hazards ranging from radiological to electrical to chemical to electromagnetic. Our mostly experimental footprint extends to many areas of the Laboratory, and well beyond the Laboratory to national and international venues. With the threat of COVID-19 now with us as we perform our work, excellence in operations—through the observance of the SCoR Principles—is even more important. Highlights of our outstanding operational work under the threat of COVID are featured in this issue, including:

- The positive response to an off-cycle request from the Office of Science to ensure the continued supply of essential isotopes that required a multidisciplinary team to bring up the LANSCE accelerator weeks ahead of its typical annual run cycle schedule, while evaluating and mitigating possible safety issues associated with the planned work in light of the newly recognized COVID-19 hazards.
- Completion of the operational startup and management self-assessment for two newly outfitted gloveboxes in the Plutonium Facility, containing new computer-numerical-controlled machining, spectroscopic ellipsometry, and Fourier-transform infrared spectroscopy, and enabling world-class plutonium materials science in support of national security missions.
- A description of continuous improvement and operational excellence for the Cygnus Dual Beam Radiographic Facility, located one thousand feet under the Nevada desert, at the U1a Complex in the Nevada National Security Site—a critical diagnostic for understanding the dynamic properties of plutonium.
- Improvements to the annual inventory for the Material Control and Accountability (MC&A) process at Sigma that resulted in cost savings and improved the work environment.
- The relentless and professional support of LANSCE-FO to LANSCE accelerator operations is depicted, along with a profile of Anthony George, operation maintenance coordinator team lead, describing his critical role in operational excellence at LANSCE.
- The development of a "magnet surge" capability at the National High Magnetic Field Laboratory-Pulsed Field Facility to deliver new high field capabilities in the 75-90 tesla range.

This issue concludes with insights from colleagues across ALDPS during this COVID-19 crisis, whether they are working from home, social distancing onsite, or experiencing a mixture of both. What have they learned from their experiences during this period that contributes to their perspective on operational excellence and the application of the SCoR Principles to their work at the Laboratory?

Finally, I would like to thank all of my colleagues in ALDPS for their patience and persistence over the past few months as we figure out together how to work safely and productively in the environment where infection from COVID-19 provides an additional, significant hazard. Our work at the Laboratory and in ALDPS is critical to the nation.

Despite the challenges of COVID, we have continued to deliver on our national security missions while keeping our workforce safe and healthy.

Toni

Safe Conduct of Research Principles

Everyone is personally responsible for ensuring safe operations.

Leaders value the safety legacy they create in their discipline.

Staff raise safety concerns because trust permeates the organization.

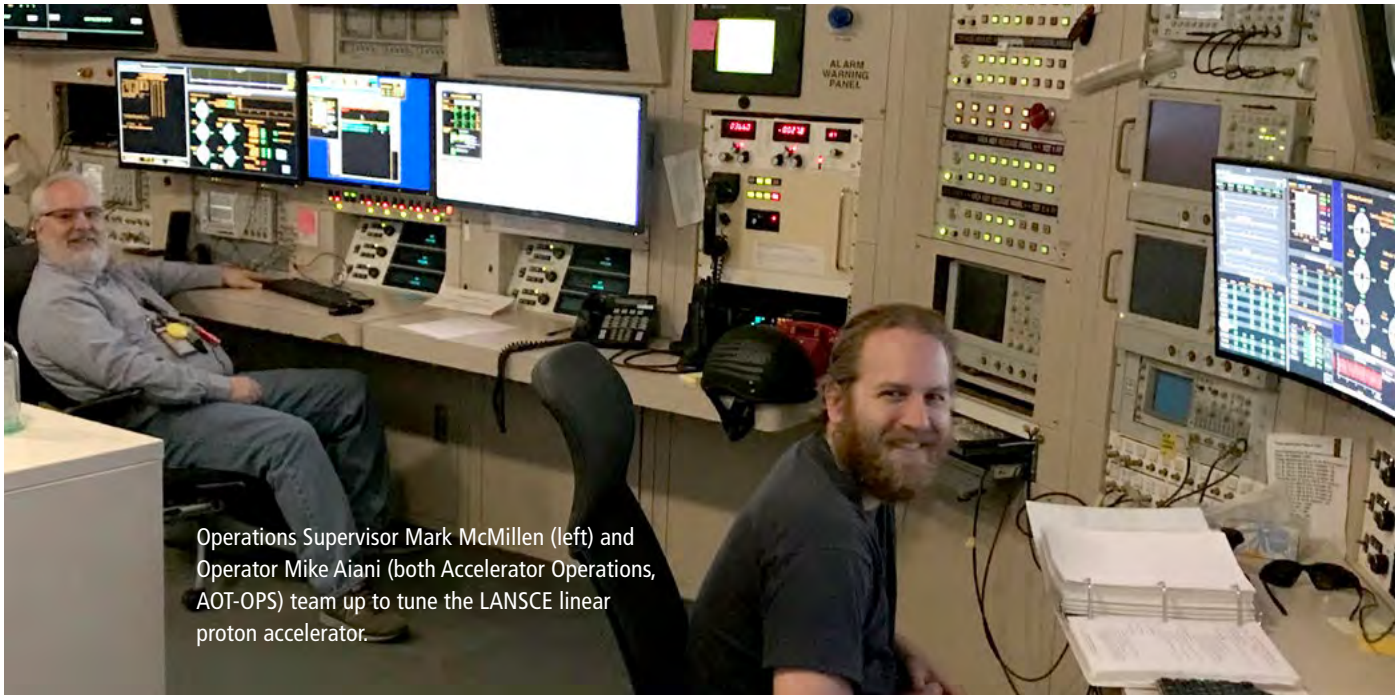
Cutting-edge science requires cutting-edge safety.

A questioning attitude is cultivated.

Learning never stops.

Hazards are identified and evaluated for every task, every time.

A healthy respect is maintained for what can go wrong.



Operations Supervisor Mark McMillen (left) and Operator Mike Aiani (both Accelerator Operations, AOT-OPS) team up to tune the LANSCE linear proton accelerator.

Dedication and collaboration accelerate mission-essential LANSCE isotope production

To support production of critically needed medical isotopes, the Los Alamos Neutron Science Center (LANSCE) accelerator powered up weeks ahead of its typical annual run cycle schedule. It was late winter at the start of the COVID-19 pandemic and while many operations at Los Alamos National Laboratory (LANL) were moving to telework, the LANSCE accelerator and the Isotope Production Facility (IPF) began ramping up as a mission-essential function at LANL in support of the Department of Energy's Office of Isotope R&D and Production.

Due to operational and maintenance successes by workers on the LANSCE mesa, multiple IPF runs were executed flawlessly. The runs generated multiple targets that were processed to ensure continued supplies of essential isotopes. An additional target will be processed for actinium-225, an isotope used in cancer treatment.

To safely execute this work required the dedication, hard work, and collaboration of a cross-organizational team that included accelerator experts, radiation protection experts, industrial hygiene experts, facility engineering experts, isotope production experts, and Laboratory management.

DOE Isotope Program Director Jehanne Gillo praised the team's extraordinary effort. "I want to reach out to everyone who is involved in keeping the DOE Isotope Program functioning through this global crisis, and sincerely thank you. … This is a phenomenal service for the Nation—and in fact—the world—that you are performing," Gillo wrote in an email on April 1 to LANL team members who helped quickly ramp up isotope production.

Gillo noted the courage required to perform work as COVID-19 disrupts normal work and life rhythms. "…As we all experience the fear and unease of these trying days for our families and friends, I can only imagine your concerns and the thoughts which might be going through your mind, which makes your continued performance so profoundly impressive."

To maintain this accelerated pace, essential workers at LANSCE and IPF implemented the Safe Conduct of Research Principles to ensure that this critical medical isotope production work continued without incident.

GET THE DETAILS

Participants: Members of Accelerator Operations and Technology (AOT); LANSCE-Facility Operations (LANSCE-FO); and Chemistry (C) divisions. **Funding:** The work is supported by the DOE Isotope Program in the DOE Office of Science. **Technical contacts:** Isotope program: Eva Birnbaum, Accelerator operations: Stephen Milton

ESSENTIAL PEOPLE, ESSENTIAL MISSION

For the IPF to meet this national need during the time of COVID-19, workers and managers evaluated the possible safety issues associated with the planned work and—in light of COVID-19 hazards—potential off-normal conditions.

Safety is always at the forefront of IPF planning given that the work involves high-current irradiations for large-scale production. However, evaluating operations in light of this new hazard required additional thought, expertise, and review. For example, not only did the team need to evaluate routine operations, but they also had to anticipate corrective maintenance should a component fail. This required evaluating reliability data for the accelerator and enlisting subject matter experts (SMEs) on biological hazards, including LANL Biological Safety Officer Dina Siegel and LANL Medical Director Dr. Sara Pasqualoni.

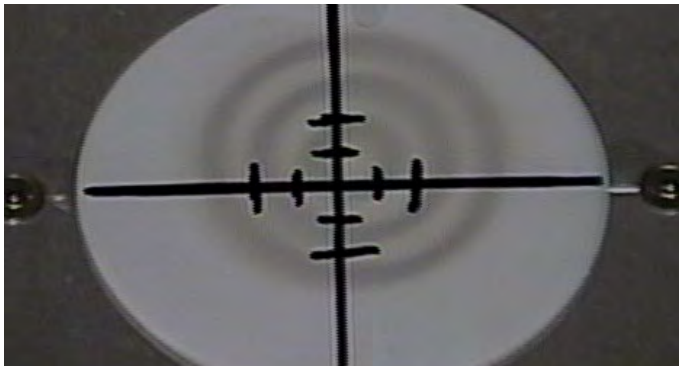
Workers and managers evaluated new parameters, such as social distancing, associated with their work. Routines were mapped out with employees and SMEs to identify approaches different from those used in the past. This meant ensuring equivalent controls for electrical and radiological hazards and also for hazards posed by the virus. They had to identify the most likely failure scenarios, evaluate how that work was conducted, and make decisions such as whether the repair would take place or accelerator operations be paused to evaluate the need for additional controls to mitigate the COVID-19 hazard. To get the accelerator operating in less time than expected, each worker had to feel comfortable to raise issues and concerns and also conduct frequent self-checks.

"I am extremely proud and equally impressed by the professional and careful effort put forward by all those involved in this special operational run for the medical isotope community," said AOT Division Leader Stephen Milton. "The thorough planning and attention to every operational and safety detail was very apparent. I wish to personally thank all those involved in making this happen during these trying times."

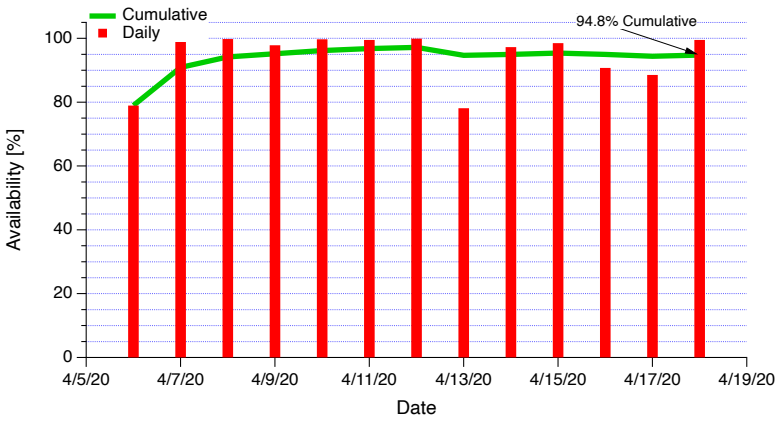
Adhering closely to the Safe Conduct of Research Principles, the workers evaluated not only planned work evolutions but also potential maintenance activities and took responsibility for their own safety and functioned as a high-performing team by looking out for each other. By maintaining a high level of professionalism and ownership, the team efficiently and quickly carried out beam run cycle procedures and addressed the national isotopes shortage. ■

At the TA-48 Hot Cell Facility, chemical processors (from left) Louie Salazar and Heath Wade (both Inorganic Isotope and Actinide Chemistry, C-IIAC) purify the desired isotopes from the Isotope Production Facility targets to produce the final products needed to support medical imaging procedures.

Isotope Production Facility operators (from left) Mike Connors and Ross Capon (both C-IIAC) prepare to use remote manipulator arms to handle the irradiated targets that contain newly formed radioactive isotopes.



Low-current tuning runs on the Isotope Production Facility target are shown. The annular pattern is a raster scan of the proton beam on a diagnostic foil.



April 2020
Isotope Production Facility
run availability.

Rigorous operations result in newly outfitted gloveboxes ready for 'hot testing'

Bringing the next generation of plutonium science online

The Plutonium Facility Equipment Installation Phase 1 (PEI1) project is vital to maintaining LANL's status as the nation's Plutonium Center of Excellence for Research and Development. PEI1 is a component of the Chemistry and Metallurgy Research Replacement (CMRR) project. With the Lab's CMR building exceeding its design lifetime, a program was begun to replace and reinvigorate the capabilities housed within. After several iterations, CMRR launched in earnest in 2014, with a total project cost of over $1 billion, including a component geared toward adding new equipment and capabilities to the Plutonium Facility (PF-4).

Working with members of Program Representation and Transition to Ops (POR-2), personnel from Nuclear Materials Science (MST-16) recently completed the operational startup and management self-assessment for two newly outfitted gloveboxes in PF-4 containing new computer-numerical-controlled (CNC) machining, spectroscopic ellipsometry (SE), and Fourier-transform infrared spectroscopy (FTIR) equipment. This signals their readiness to transition to "hot testing" with plutonium.

PRECISE PLANNING, COMMUNICATION ENSURE SUCCESS

For such a large and complex project, reaching this point exemplifies operational excellence. LANL personnel were working with the vendors long before the equipment arrived onsite. Preparation activities included POR-2, MST-16, and design subcontractor Merrick personnel visiting the vendor location to perform factory acceptance testing of the equipment and to preempt potential installation problems. While onsite, LANL personnel used mockups of the gloveboxes to check the eventual fit: they developed procedures for disassembling the equipment, passing it through the glovebox windows, and reassembling it.

After shipment to LANL, the instruments were staged in the Radiological Laboratory/Utility/Office Building at TA-55, near PF-4. Taking advantage of open laboratory space that had just finished being constructed, users conducted a round of site acceptance tests with the vendor and familiarized themselves with the instruments prior to their installation in PF-4.

The final transition to PF-4 required detailed coordination between vendors, craft workers, POR-2, Operational Readiness and Execution (ORI-2), and MST-16 to finalize the installation. Challenges faced by the team included following the rigorous conduct of operations and safety requirements for scheduling and performing work in a nuclear facility, compounded by the fact that installation occurred in a room actively engaged in essential work. Due to detailed planning and communication with the wide range of potentially affected processes and workers, downtime and impact to other work was kept to a minimum. The culmination of these efforts was approval from the Facility Operations Director to start hot testing of the equipment, which was scheduled to start in early June.

ADVANCING SCIENCE FOR NATIONAL SECURITY

MST-16 scientists and technicians, having finished cold testing of the new equipment, are now preparing to introduce plutonium samples into the gloveboxes to demonstrate operational readiness of their intended uses. The new CNC machining capability will modernize the ability to prepare small plutonium samples for research. What previously was a tedious process of cutting, polishing, and shaping samples using hand or small power tools can now be performed with computerized speed and precision, making the work more efficient and safer. The new SE and FTIR use polarized and infrared light, respectively, to study surface properties of plutonium. These will give scientists the ability to study the oxide surface that grows on metallic plutonium and to study other potential surface contamination and corrosion processes.

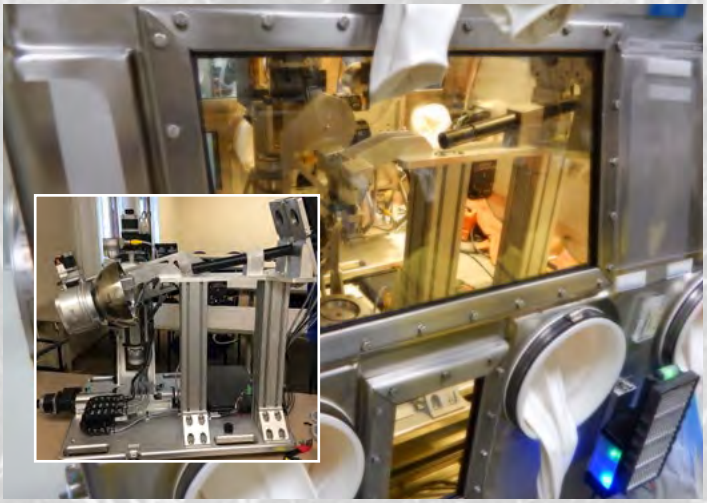
These new PEI1 instruments will be used by MST-16 to advance the materials characterization capabilities, formerly found in CMR, as part of the Laboratory's overall stockpile stewardship. By allowing for faster sample preparation and advanced characterization of plutonium surfaces, MST-16 will be able to provide world-class plutonium materials science in support of the pit production, pit surveillance, and other national security missions. ■

GET THE DETAILS

Participants: Members of Program Representation and Transition to Ops (POR-2); Operational Readiness and Execution (ORI-2); Nuclear Materials Science (MST-16); and Maintenance and Site Services Division (MSS). **Funding:** Chemistry and Metallurgy Research Replacement project, managed by TA-55 Capital Projects. **Technical contact:** Dan Olive

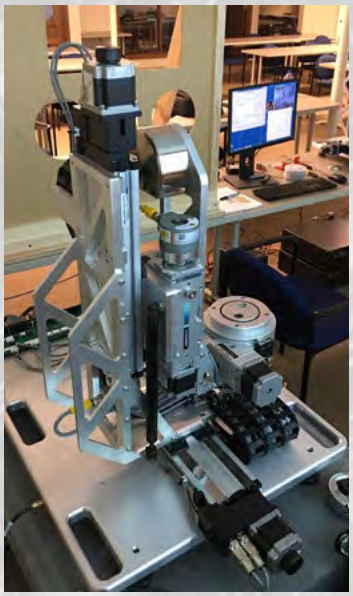
Testing the Fourier-transform infrared spectroscopy equipment in the Los Alamos Radiological Laboratory/Utility/Office Building using a mockup of the glovebox to check the fit of the light pipe before installation in the Plutonium Facility.

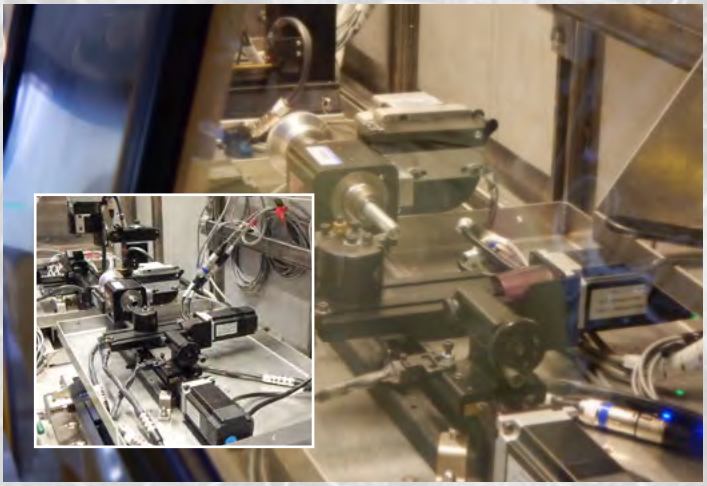
Preparing the ellipsometer for installation in the Lab's Plutonium Facility.



Ellipsometer installed in the Plutonium Facility, performing the same round of testing as it did at the factory (inset), signifying readiness to transition to plutonium operations.

ABOVE and RIGHT: Testing the installation and assembly procedure of the ellipsometer at the factory using a mockup of the glovebox allowed the team to streamline installation in the Plutonium Facility.





Test machining of an aluminum rod in preparation to "go hot" with plutonium. INSET: Computer-numerical-controlled mill and lathe being installed in glovebox.

Background image: Plutonium microstructure.

Cygnus: Continuous improvements and meticulous operations **deliver high-value subcrit data**

One thousand feet under the Nevada desert, at the U1a Complex in the Nevada National Security Site, is a national asset: the Cygnus Dual Beam Radiographic Facility. Cygnus, featuring two locomotive-size flash x-ray machines, performs stockpile stewardship experiments that reveal the dynamic properties of plutonium. Year round, the Cygnus team tunes, prepares, and practices for these high-performance, high-value subcritical experiments (SCEs), which can take years from planning to execution.

In the U1a facility, Los Alamos researchers combine flash radiography, appreciable quantities of high explosives, and plutonium metal to generate essential data that cannot be obtained anywhere else in the nation.

In the past 16 years, Cygnus has contributed to seven subcritical experiments and has completed the confirmatory, a practice shot that uses all of the key components except the plutonium metal, for the next set. It has also been used in many physics experiments, most notably the 12-shot Thermos series.

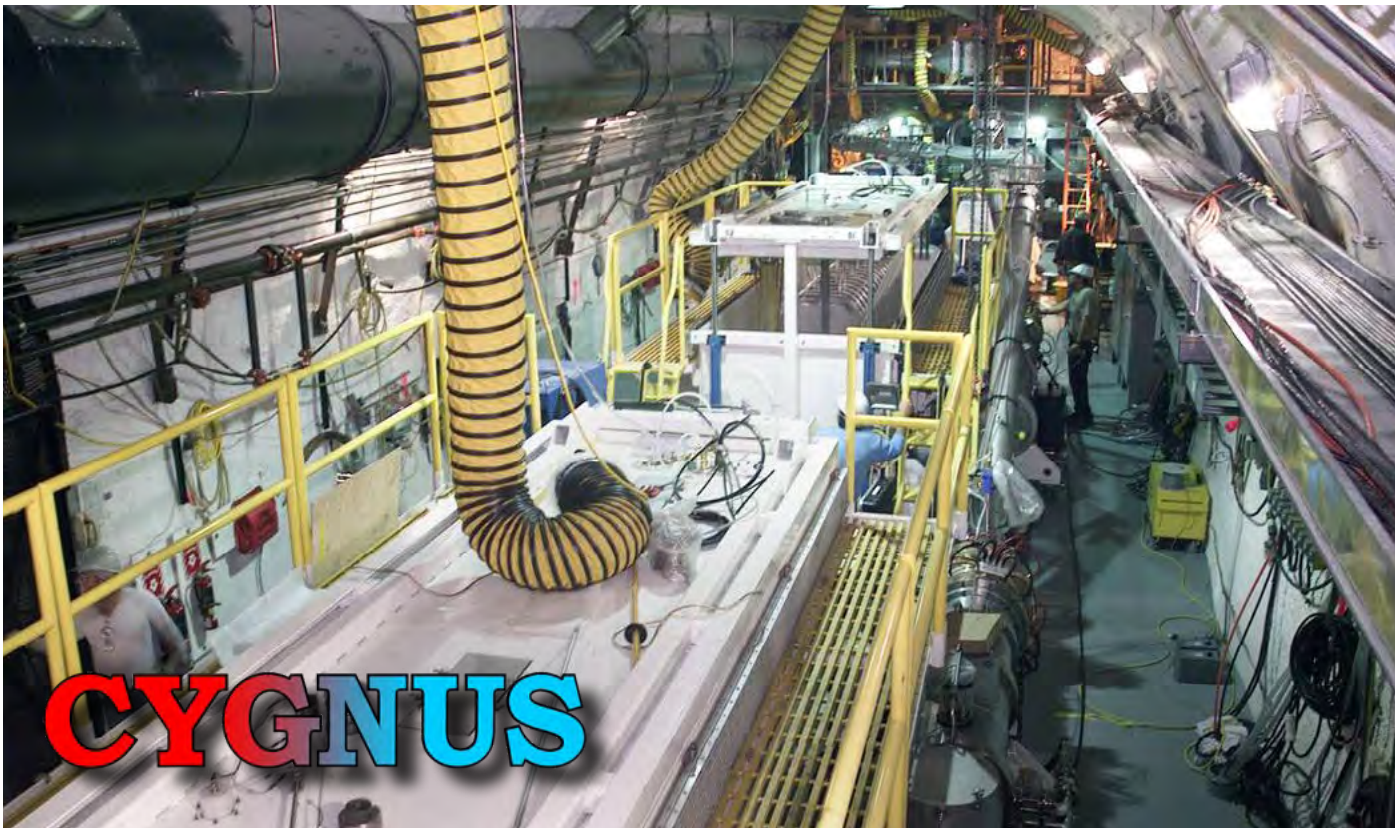
Cygnus was initially designed for a single focused experiment (Armando) in 2004, yet its history follows two themes: steady improvement to its capability and careful, meticulous operation. On Armando, Cygnus radiography delivered good quality measurements. Since then, consistent incremental improvements have advanced the instrument well beyond its original capabilities. For example, improved optics, more sensitive detectors, rod optimization, and material selection have enabled quantitative density measurements covering six orders of magnitude. The instrument has been used to penetrate thick, integrated experiments such as Pollux and Ediza and returned to make quantitative measurements of low-density ejecta signals for the Red Sage subcritical experiment series.

The design of the Cygnus system comes with an operational cost. The diode is destroyed and must be rebuilt for every pulse. As a result, each image is created with a new diode, and the performance of the machine is determined by the quality of the build and the skill and practice of its operators.

"While preparing for an experiment, the team will routinely perform two shots in a day, making quality of operations central to its operation," said Red Sage Diagnostic Coordinator Jeremy Danielson (Neutron Science and Technology, P-23).

In 2003, John Smith (P-23) supervised installation of the machines and has carefully shepherded the facility through 16 years of operation and improvement, including seven successful SCE series. In February 2019, the team completed shot 4000 and is at shot 4330 for the Nightshade experiment, Iris. The researchers expect to continue through many more SCE projects with the upcoming series of Nimble and Great Basin. Cygnus and its personnel remain a singular national asset and essential to the nation's nuclear posture. ■

SCE	Year
Armando	2004
Bacchus	2010
Barolo A	2010
Barolo B	2011
Pollux	2012
Vega	2017
Ediza	2019
Nightshade A-C*	*Expected 2020–2021



Cygnus facts

- Designed in collaboration with Titan-Pulse Sciences Division, Bechtel Corporation, the Naval Research Laboratory, and Sandia and Los Alamos national laboratories.
- Consists of a Marx bank and inductive voltage adder driving a rod-pinch diode. The rod pinch diode was developed by the U.S. Naval Research Laboratory.
- Each source has a 50-nanosecond pulse width with 2.2 MeV endpoint energy, making it well suited for focused physics experiments on shocked plutonium metal.
- Where Cygnus truly shines is resolution. The rod pinch allows spot sizes below 800 microns, with a full system resolution of 300 microns. This is ideal for measuring finely detailed metal behavior during dynamic experiments.
- Facility is operated jointly by Sandia National Laboratories, Los Alamos National Laboratory, and Mission Support and Test Services, with the Joint Laboratory Office–Nevada providing crucial technical, administrative, and DOE interface support.

GET THE DETAILS

Participants: The Cygnus team includes John Smith (Neutron Science and Technology, P-23); Gene Ormond, Michael Garcia, Martin Parrales, Dan Bozman (Sandia National Laboratories); Keith Hogge, Hoai-Tam Truong, Paul Flores, Dale Crain, Mark Fiscus (Mission Support and Test Services). **References:** G. Cooperstein et al., "Theoretical modeling and experimental characterization of a rod-pinch diode," *Physics of Plasmas*, 8 (10), (Oct 2001). J. Smith et al., "Cygnus performance on seven subcritical experiments," 2019 IEEE Pulsed Power and Plasma Science Conference; June 2019. **Funding:** Office of Experimental Sciences and the SCE program. **Technical contact:** Jeremy Danielson

Safe, efficient, organized approach to legacy materials **enables Sigma mission-critical work**

Directly impacts MC&A process and results in cost savings, improved work environment

Responsible for overseeing and managing nuclear materials operations in the Sigma Complex, Chastity Vigil (Sigma Division, Sigma-DO) and her Material Control and Accountability (MC&A) teammates encountered a facility that had become so crowded and cluttered it was difficult to access and assess what the building contained. This included legacy nuclear material and nuclear material waste held in outdated wooden crates.

Vigil's team assessed the Butler building wall-to-wall and identified and addressed multiple issues related to its storage of the legacy Rocky Flats site items.

Through the team's improvements prior to an annual inventory earlier this year, Sigma and Safeguards divisions were able to avoid at least 20 action forms, which could have led to Sigma's nuclear material account being closed for up to a year. The team's work had a positive impact on more than 50 programmatic projects—and resulted in cost savings, an improved work environment, and improved accountability.

For example, the team established nuclear material boundaries by isolating the material behind mesh fencing, making maintenance simpler. They decreased exposure to radioactive materials through the installation of tamper indicating devices, thus eliminating the need to open each container to verify contents. "We were able to wrap chains on each stack of four [crates] and apply locks and tamper identification devices to ensure the integrity of all accountable items," said J.D. Montalvo (Sigma-DO). The team improved safety by eliminating the need for awkward body positions when uncrating and re-crating materials.

Their work is an example of the Safe Conduct of Research (SCoR) Principles at work. SCoR Principles allow employees to get their work done safely, securely, and efficiently.

In performing its evaluation, the MC&A team identified and evaluated hazards for every task, every time. They maintained a healthy respect for what could go wrong and prepared for the project with this possibility in mind. Team members said they also recognized that everyone is personally responsible for ensuring safe operations. "I think the most important thing is taking ownership of your work," said Jonathan Zambrano (Sigma-DO). "And if you see something wrong, say something. If we see that there may be a safety concern, we say something."

Vigil said that she and her team keep communication, planning, and teamwork at the forefront of every project. By emphasizing these values, she embodies the principle that leaders value the safety legacy they create in their discipline. She said her motivations stem from personal principles: "We just want to return safely to our families. That's what's most important to all of us." ■

Storage of materials in the Butler building was haphazard, making it difficult to access and assess the contents of containers.

After the cleanup, reorganization, and re-packaging of material in the Butler building, containers are much easier to access.

GET THE DETAILS

Participants: Members of PIO Manager of Construction (PIO-CM); Construction and Project Support (DESH-CPCS); Science and Technology Operations (DESH-STO); Logistics Central Shops (LOG-CS); Nuclear Material Control and Accountability (SAFE-NMCA); and Sigma Division (Sigma-DO). **Technical contact:** Chastity Vigil

Delivering responsiveness for **LANSCE research and accelerator operations**

Maintaining the complex infrastructure of the Los Alamos Neutron Science Center (LANSCE) mesa requires exquisite flexibility—the ability to manage and execute a range of long-planned projects and to improvise and quickly respond to unexpected events.

Members of LANSCE-Facility Operations (LANSCE-FO) and its deployed Maintenance and Site Services (MSS-LFO) personnel display just that. For example, two recent projects—one months in the planning and another just days in the making—are prime examples of their agility in delivering excellence in mission operations.

STAYING COOL AND SUPPORTING A CRITICAL DELIVERABLE

For 18 years LANSCE's cooling towers have mitigated heat buildup generated through the accelerator's operation. The towers circulate a mixture of fluid ("media") to quickly cool and filter the mixture. During this year's annual LANSCE operational period, workers discovered that one of the towers was losing efficiency. "We realized that the media was getting clogged up due to age," said Anthony George (MSS-LFO).

Swinging into action George and the MSS-LFO team began planning to remedy the situation. The work required complex coordination and teaming across several Laboratory organizations, including Acquisition Services Management, which secured the contract for the work; MSS-LFO, which would oversee the work's execution; and the subcontractor that would be on site to replace the media and the filters.

Yet, after the schedule was set, the need arose to restart the LANSCE accelerator early in support of producing critical medical isotopes. This required completing the cooling tower work earlier than planned. Showing keen adaptability, George met daily with the subcontractor foreman to plan for delivery of new material even as Lab craft workers hauled away old filters. Working 10-hour days and weekends, the team completed the project, enabling an early start to the run cycle (please see "Dedication and collaboration accelerate mission-essential LANSCE isotope production," page 2).

RESPONDING INTENSELY TO A POWER FAILURE

On a bitterly cold morning in January, several buildings on the mesa suffered a power outage, creating not only a frigid work environment for employees, but a potentially catastrophic situation, as the buildings' pipes contained a significant amount of water that could freeze. This threatened the buildings' integrity and required shutting down the sophisticated equipment within.

To meet the LANSCE cooling tower project's accelerated schedule, cranes, portable generators, and forklifts were brought in to quickly disassemble and reassemble components.

New spray arms and spray nozzles were installed as part of the cooling tower project.

New cooling tower filters arrived even as spent filters were being hauled away, the result of careful planning by LANSCE-Facility Operations crew in coordination with the subcontractor.

continued on next page ▶

GET THE DETAILS

Participants: Members of LANSCE-Facility Operations (LANSCE-FO); Maintenance and Site Services (MSS-LFO); Logistics Central Shops (LOG-CS); Logistics Superintendent Field Work Execution (LOG-SUP); Logistics Heavy Equipment Roads and Grounds, (LOG-HERG); Maintenance and Site Services Utilities and Infrastructure (MSS-UI). **Funding:** Maintenance at LANSCE is funded by Weapons Infrastructure. **Technical contact:** Anthony George

Delivering responsiveness continued

Again, the MSS-LFO crew mobilized. They located the faulty switch that was the cause and coordinated its custom alteration, the crane to move it into place, and the switch's installation. While doing so they located portable heaters and strategically placed them throughout the affected buildings until electricity could be restored, and once it was restored, methodically powered up equipment.

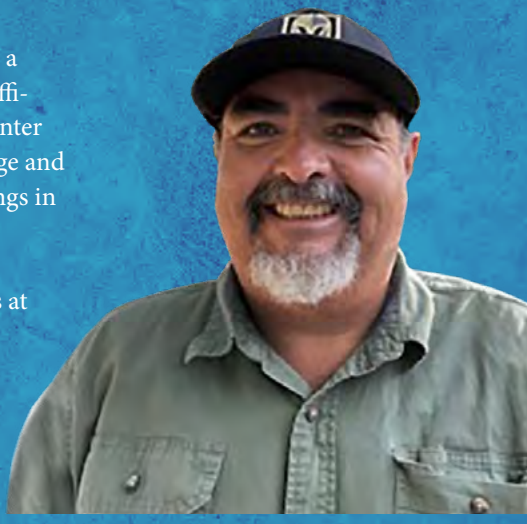
"The coworker who's worked the shortest amount of time with me has been here five years and the longest 25 years," George said. "So we know the facility very well, and we pass on knowledge to each other. That's what happens all of the time with members of our team. They really rely on each other and help each other." ■

On a bitterly cold day this winter several buildings on the LANSCE mesa suffered a prolonged power outage due to a blown switch (shown above).

Members of LANSCE-Facility Operations and Maintenance and Site Services coordinated the restoration of power, which required removing the old switch and fabricating and installing a new one. Here, a crane delivers the new switch to be placed on the roof where the switch is housed.

MEET ANTHONY GEORGE

Operation Maintenance Coordinator Team Lead (LANSCE Facility Operations, MSS-LFO)



Anthony George said he never knows what to expect when he goes to work. George manages a five-member maintenance and site services crew responsible for ensuring safe, reliable, and efficient infrastructure maintenance and utilities support at the Los Alamos Neutron Science Center (LANSCE). "My days really go quite fast," he said. "There's a lot of work going on here." George and his team support the LANSCE accelerator, experimental facilities, and all the outlying buildings in between on the more than 1.5-mile-long mesa.

Over his 27 years at the Lab, George has created a network that allows him to assemble teams at a moment's notice, which helps him tackle the variety of projects he encounters (please see "Delivering responsiveness for LANSCE research and accelerator operations," previous page). In doing so, he always puts his coworkers' well-being first. "The safety aspect is important," he said, adding that whether working in a highly energized environment or in an office space, "we really want to go home in one piece and unhurt." Watching out for your coworkers is everyone's responsibility, he said.

In addition to maintaining close relationships with his colleagues, George has developed an affinity for the machinery he watches over at LANSCE. "I really like all of the equipment they have here and the science they do here, especially with the accelerator," he said. "Everybody who works out here is pretty much tied to that machine … so everyone takes real pride in keeping it and all of the equipment that serves it going." ■

‘Magnet surge’ expands capabilities for **higher tesla science**

As the only pulsed field user facility in the country, the National High Magnetic Field Laboratory-Pulsed Field Facility (NHMFL-PFF) attracts researchers from around the world who use its magnets for condensed matter physics studies. High magnetic field magnets are essential in understanding physics phenomena that range from high-temperature superconductivity to quantum matter.

In a $1.1 million initiative by the National Science Foundation from the NHMFL at Florida State University, the Los Alamos mag lab is set to deliver new capabilities in the 75-90 tesla range. This “magnet surge” delivers a high payoff for basic research performed as part of the NHMFL-PFF’s user program and in support of LANL’s national security science mission.

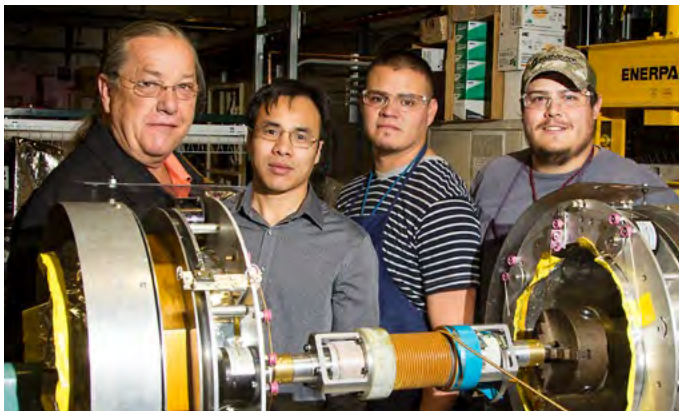
“When combined with the LANL generator in future magnet designs, the systems, experience, and knowledge developed through the NHMFL-PFF magnet surge are directly applicable to future ambitions for pulsed magnetic fields and science above 100 tesla,” said NHMFL-PFF Director Michael Rabin. As the home of the 100-tesla magnet system, the NHMFL-PFF has held the world record since 2012 for nondestructive magnetic field production.

Magnet-capability advancements include increasing production tempo, converting the facility’s current magnet-development cell to a user-science cell for 75-80 tesla experiments, building a new magnet-development cell with the increased containment capability necessary for 80-90 tesla magnets, and investing in key systems for 80-90 tesla operations powered by a higher-voltage capacitor bank.

Already, faster magnet production has put a 75-tesla duplex magnet into service and its descendant, the 85-tesla magnet, is expected to be online in 2021. “The successful commissioning of 75-tesla and the coming 85-tesla magnets will pave the way for us to think about future duplex designs for the 100-tesla inserts to push the envelope and go beyond 100 tesla, maintaining our leadership in generation of ultrahigh magnetic fields for cutting-edge science,” said Doan Nguyen, who leads the NHMFL-PFF pulsed magnet development team.

These complex magnets are constructed by mag lab researchers, technicians, and technologists who specialize in this one-of-a-kind experimental equipment design. Ongoing research informs their decisions that range from the type of tools and techniques devised to the combination of materials used. For example, the latest magnets use an innovative design of nanostructured copper alloy wiring mechanically reinforced with the strongest Zylon polymer fibers and stiff MP35N metal shell. They employ two separately powered coils to maximize the produced magnetic fields and leverage novel computational models to calculate the magnet’s mechanical, thermal, and electromagnetic performance.

“With each run of the magnets, we learn something new and that helps us to continuously improve the magnet design and fabrication,” Nguyen said. ■



Building the 75-tesla duplex magnet are, from left, Dave Sattler, Doan Nguyen, Jason Lucero, and James Michel.

The 75-tesla duplex cell is shown during a user experiment. The magnet, cooled with liquid nitrogen, is placed inside a blast-containing vessel.

GET THE DETAILS

Participants: Doan Nguyen, James Michel, Jason Lucero, John Singleton, Fedor Balakirev, (National High Magnetic Field Laboratory-Pulsed Field Facility, MPA-MAGLAB); Darrell Roybal (DARHT Physics and Pulse Power, J-5); David Sattler (Dynamic Structure Design and Engineering, J-2). **Funding:** Magnet surge work at the National High Magnetic Field Laboratory-Pulsed Field Facility is funded by the National Science Foundation.
Technical contact: Doan Nguyen

In your words ...

Whether working from home, social distancing onsite, or a mix of both, all of us continue to contribute to the Lab's national security mission. A healthy safety culture makes us good colleagues—and good neighbors. As we adapt to a changed work situation, we asked members of ALDPS for their perspective on operational excellence, applying the Safe Conduct of Research (SCoR) Principles, and what they have learned during the process.

WHAT DOES EXCELLENCE IN MISSION OPERATIONS MEAN TO YOU AS WE GO ABOUT WORKING UNDER UNUSUAL CIRCUMSTANCES? ▼

Elida Summers, *Administrative Assistant,* Materials Synthesis and Integrated Devices (MPA-11)

Excellence in mission operations means to me that new processes, to reflect the unusual circumstances, need to be implemented and executed in order to get the job done. For example, some group members have been busy working on COVID-19 projects. By offering my support, I would like to think that I have made their workload lighter—enabling them to focus on their research.

Hunter Swenson, *R&D Engineer,* Fabrication Manufacturing Science (Sigma-1)

I am mostly working from home and coming onsite periodically for specific work activities. Excellence in mission operations means meeting deliverables on time while working safely and securely. These unusual circumstances also require us to be especially mindful of our colleagues' well-being.

Tracy Salazar, *Professional Staff Assistant,* LANSCE Facility Operations (LANSCE-FO), TA-53 WESST Chair

I think excellence in mission operations remains the same, whether working remotely or being present at the Laboratory. … One of the SCoR Principles is "learning never stops." This unusual, unforeseen change is a perfect example. We all had to accept the change and learn new aspects of our positions to ensure the success of our organizations and our sites. By properly communicating and learning new technology, our organizations have been able to function and still maintain the goals of the Laboratory.

WHAT LESSONS LEARNED—OR PERSPECTIVE—FROM THIS SITUATION WILL YOU TAKE WITH YOU WHEN WE ARE BACK ONSITE AND WORKING SIDE-BY-SIDE WITH OUR COLLEAGUES? ▼

Gary Rouleau, *Team Leader,* Accelerators and Electrodynamics (AOT-AE)

How often do we get the chance to reflect on our jobs? My team started a series of remote training exercises, which has given us the time to visualize and organize our tasks, to see the big picture as they say. Accomplishing a goal in your mind's eye leads to a clearer path to success.

Leonard Gonzales, *Research Technician,* Quantum (MPA-Q)

We all have families and loved ones and we are all equal. …We need to do our best to not only protect ourselves, but each other. I hope that this perspective is carried over after the pandemic, and we keep this newfound unity in our everyday lives and pass it on to future generations.

HOW ARE YOU APPLYING THE LAB'S SCoR PRINCIPLES TO YOUR CHANGED WORK OR HOME SITUATION? ▼

Nicholas Sirica, *Technical Staff Member,* Center for Integrated Nanotechnologies (MPA-CINT)

As I start to transition from working at home to working onsite, the SCoR Principles will be at the forefront of my mind. This means not only being responsible for ensuring productive and safe operations, but understanding that a perfectly safe operation under normal circumstances may need to be re-evaluated due to constraints imposed by social distancing, etc. By evaluating old hazards in these new times, we can gain a fresh perspective and maybe even come up with a better way of doing things.

Robin Montoya Pacheco, *R&D Engineer,* Fabrication Manufacturing Science (Sigma-1)

I always feel that "a healthy respect is maintained for what can go wrong" is something that applies to me onsite and at home. Onsite, we do daily checklists to make sure we know what needs to be done … to perform work safely. … When I started working at home, I often reviewed the TeleHub. … Once I was well versed, working from home became more comfortable. Still it's always good to have a questioning attitude when doing something new to make sure everything is performed safely and securely.

Joseph F Dabney III, *TA-53 Operations Manager, pRad Experimental Area Manager,* LANSCE Facility Operations (LANSCE-FO), ALDPS WESST Vice-Chair

The SCoR Principles I regularly use during this time are "everyone is personally responsible for ensuring safe operations," "cutting-edge science requires cutting-edge safety," and "learning never stops." If I had to advise coworkers on working remotely, I would suggest keeping a good routine, setting daily goals, and taking care of your mental health by checking in with your teammates (small talk).

WHAT WAS THE BIGGEST CHALLENGE OR UNEXPECTED CIRCUMSTANCE YOU CONFRONTED WHILE CHANGING YOUR WORK ROUTINE? ▼

Kari Goen, *Professional Staff Assistant,* Nuclear Materials Science (MST-16)

The biggest challenge I have seen for myself and many others at this time is the adaptation of communication in a world with limited contact. … I currently strive to adapt my communication to be more precise and thorough. I have changed my way of doing business to meet this challenge and ensure support of the mission.

Noah Birge, *Postdoctoral Research Associate,* Neutron Science and Technology (P-23)

Having branched out from the field on which I focused in grad school, effective communication is key in my catching up and getting up to speed with the work of the Advanced Imaging Team. … Time away from group members has necessitated my actively working to improve upon these skills. Daily remote meetings with my mentor to discuss my work, progress, and difficulties have lent themselves well to this endeavor.

WHAT KEY TRAIT OR ELEMENT HAVE YOU MOST HAD TO CALL ON DURING THIS SITUATION? ▼

Maggie Caballero, *Professional Staff Assistant,* Proton Radiography, Applications, Development (P-26)

"Improvise, adapt, overcome." On the surface, it is cheesy meme material, but I believe that my ability to be comfortable thinking outside of the box has really helped me deal with these circumstances that we are faced with. Some of the processes that I use have changed from one day to the next. Rather than get frustrated, I just keep in mind that we are all trying to figure out how to move forward.

Danielle Bergemann, *Professional Staff Assistant,* Physical Sciences (ALDPS)

A key trait that I have had to call on for my work life would be learning agility. Teleworking took effect very quickly; consequently, that meant learning how to conduct business under completely different circumstances. With that in mind, we have begun exploring new ways to conduct business. This would include the implementation of new programs to include Webex and G Suite. These programs have improved business consistency throughout the directorate.

Priscila Rosa (Quantum, MPA-Q) aligns a single crystal in an x-ray diffractometer to determine the properties of its crystalline lattice.

Associate Laboratory Director for Physical Sciences:
Antoinette J. Taylor

Physical Sciences Vistas, produced by Karen Kippen, Jim Cruz, and Renae Mitchell, is published by the Physical Sciences Directorate at Los Alamos National Laboratory.

For more information about this publication, contact aldps-comm@lanl.gov.

LA-UR-20-25590

Los Alamos National Laboratory, an affirmative action/equal opportunity employer, is operated by Triad National Security, LLC, for the National Nuclear Security Administration for the U.S. Department of Energy under contract 89233218CNA000001.

Los Alamos NATIONAL LABORATORY

NNSA National Nuclear Security Administration